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THE HERBARIUM OF PISA BOTANIC GARDEN : SCIENTIFIC TRADITION SHAPES ITS FUTURE

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ABSTRACT

Almost 450 years ago, the foundation of the first Botanic Gardens, to which herbaria were readily associated, marked the birth of botany as autonomous discipline.

After alterne phases of concern and disregard as to their role, today it is generally acknowledged that these institutions resources and capabilities must be exploited to successfully confront with the global challenge posed by environment degradation.

In our country, this awareness is mirrored by the attentive interest paid to a recent international symposium organized by the Botanic Garden of Pisa, in celebration of its 400 years od existence and activity, during which the role of herbaria was also discussed, and by the expectations raised by the congresses scheduled at the Herbarium of Florence (September, 1992) and at the Botanic Garden of Padua (1995).

The Herbarium of Pisa has a long standing tradition of study and research. At present, it is divided in two sections : the historical and the current collections. The historical collections, assembled by renowned botanists, such as Giuseppe Raddi, Gaetano Savi and Teodoro Caruel, mainly in the last century, are not added to, in view of their value as documentation of their compiler's activity; furthermore, they contain several type specimens.

The current collection, on the other hand, is routinely added to with exsiccata of various origin, ranging from S. Europe to N. Africa and Middle East.

The overall 500000 specimens maintained in the Herbarium provide a noteworthy body of scientific data recorded over a considerable length of time. Current research and management activity are briefly discussed.

In the year 1544, Luca Ghini (1490-1556), a renowned physician and a skilled botanist from Imola, came to Pisa in order to teach botany at the University (Savi, 1828).

He had accepted the post when the grand duke of Tuscany Cosimo I de' Medici, who had invited him to Pisa, granted his permission to create a Botanic Garden specifically devised and planned as an education tool for use in University classes (Galassi, 1992).

Until then, botany professors lectured with the aid of textbooks illustrated with approximative plant drawings, such as those found in the medieval herbals (Arber, 1986). Their students were never shown live plants during the course (Cristofolini, 1992).

Ghini, on the other hand, introduced a dramatic change to this method : he showed live plants in his lessons, which were collected in the wild and then kept in cultivation in the Pisa garden (Garbari *et al.*, 1991).

Not content with this remarkable breakthrough, Ghini's innovative mind went further on : he assembled a collection of dried plants - an herbarium, probably using plants grown in the garden - that allowed him to show from real all the parts of a plant, and particularly its reproductive structures, independently of its phenological phase (Chiovenda, 1927).

Neither Ghini's herbarium, nor his Botanic Garden, survived until our days : we only know of their existence and use by his correspondence and by the notes taken during classes by his students (De Toni, 1907;1907a).

But in a few years' time, many Botanic Gardens with associated herbaria were established in the academic centres all over Europe; not surprisingly, some of the new institutions were directed by Ghini's brightest disciples : L. Anguillara at Padua, U. Aldrovandi at Bologna, A. Cesalpino at the second garden of Pisa (Chiarugi, 1953).

Besides their unsurpassed efficiency as educational aids, the tools developed by Ghini proved to be a very useful support also for study and research purposes; species from various region of the world could be easily observed in every phase of their life cycle when they were cultivated in the garden; the exsiccata represented a convenient way of sharing information between botanists of different countries as well as a permanent reference material upon which plant descriptions could be based or compared (Cristofolini, 1992).

It is also worth mentioning here that Ghini was the first scientist, in Italy, who hired professional painters in order to depict, in full colours and with utmost attention to every detail, plants either cultivated in the garden or observed in the wild: in this case, he followed the footsteps of other notorious botanists who had already laid the foundation of scientific iconography in Germany (Seybold, 1990).

As a consequence, Pisa became the centre of an intense plant research activity, that focused not only on their medicinal properties - the main interest of the previous years - but also on morphological features, growing habit, distribution, etc., rendering botany an autonomous discipline of academic rank (Garbari, 1980; 1992).

A. Cesalpino (1525 1563), probably Ghini's most renowned disciple and director of the Pisa garden from 1554 until about 1591, used his own herbarium to support his new theories about the systematics of the Plant Kingdom - which included elements of stunning modernity (Garbari *et al.*, 1991) - published in 1583 under the title "De Plantis Libri XVI".

Over the centuries, herbaria played a primary role for the definition of taxonomic systems, plant distribution pattern and nomenclatural standards.

Nevertheless, neither a long standing tradition nor an international reputation saved the "Herbarium Horti Botanici Pisani" from periods of unappropriate management or lack of it at all, testified by the alternating rate of new introductions and the outdating of the indexes to the collections.

A new interest for the herbarium collections and their proper management has sprung up in relatively recent years, as alarming signs of deterioration of the ecosystems in our region and increasing public awareness about environmental topics have urged the public administration to launch preservation projects (Garbari, 1983).

The institution of regional preserves and parks stimulated floristic and vegetation research, particularly in the N.W. Tuscany wetlands, home to rare species and microthermic relics; the herbarium allowed to check, over a long period of time, the permanence or disappearing of these plants in some biotopes (Tomei *et al.*, 1991).

The results of these studies were a valuable help for building a strategy of safeguard of the biotopes and for assessing land usage classes in various areas of the territory.

The comeback of interest for the support that can be provided by a herbarium was mirrored by the attentive interest paid to the International Symposium "The 400 years of Pisa Botanic Garden: is its past the key to its future ?", held at the third Botanic Garden of Pisa in October, 1991, that featured also a number of communications related to herbaria (Bedini and Garbari, 1992). The symposium, attended by over 200 delegates, captured mass media space; a similar event is planned to take place at the Botanic Garden of Padua, which will celebrate its 450 years of operation in 1995. And even without the shell of a Botanic Garden, the *Herbarium Centrale Italicum,* in Florence, attracted both scientist and media attention during the International Symposium "Botanical Collections and Scientific Research", organized to celebrate its 150th years of existence, where topics related to the Florentine botanical collections, the role of herbaria in scientific research and management techniques were discussed (the proceedings will appear on Webbia, in 1993).

Herbarium Horti Botanici Pisani : history of collections and present activity :

As mentioned earlier, Ghini's exsiccata did not reach our days, but the concepts he introduced were maintained by his disciples and successors. As stated before, Cesalpino put together a herbarium that, unlike Ghini's one, is still extant and is kept at the Botanical Museum of Florence (Moggi, 1981).

In the Herbarium Horti Botanici Pisani, the oldest exsiccata, dating to 1789, bear the signature of Gaetano Savi (1769 1844). He collected the specimens during the explorative campaigns organized and conducted by Giorgio Santi (1746 1822), director of the Pisa Garden from 1782 until 1810, of whom Savi was first assistant and later on successor at the head of the Garden (Amadei, 1987).

Savi's interest for Herbarium was paralleled by his intense effort to increment the number of specimens, by means of collecting expeditions, exchanges and incorporation of other collections, such as Giuseppe Raddi's personal one, that included species from Brazil and Egypt (Tomei, 1980).

As a result of Savi's policy, around 1830 the Herbarium was constituted by different and significant collections, all embedded into a single body of about 13,000 species (Amadei, 1987).

At the end of the XIX century, another renowned botanist, Teodoro Caruel (1830 - 1898), who had directed the Botanic Garden of Pisa from 1871 until 1880, donated to the Herbarium his own collection, composed by about 14,500 specimens of italian plants.

Caruel's exsiccata were not intermingled with the extant specimens; rather, they were kept as a separate collection and since that time the Herbarium Horti Botanici Pisani has been divided in two sections: the current and the historical collections (Amadei, 1987).

The historical collections are not added to, in view of their value as documentation of their compiler,s activity; furthermore, they contain type specimens (Savi, 1830).

Among them we may cite the collections of C.Costa Righini, A. Bottini, G. Arcangeli, N. Passerini, M. Guadagno and P. Pellegrini. Besides the exsiccata, other items were associated to this section: wax models illustrating G.B. Amici's microscopic observations (Maugini, 1987) and fungi (Monti & Del Prete, 1978), portraits of renowned botanists of the XVI and XVII century, the ancient wooden main gate to the garden and a skillfully crafted cabinet used for seed storage (Garbari *et al.*, 1991).

The current collection, on the other hand, is routinely added to with exsiccata of various origin, ranging from S. Europe to N. Africa and Middle East. Particular attention is devoted to plants of the wetlands and of the mountain range of N. W. Tuscany.

As mentioned earlier, some of the indexes became outdated due to unappropriate management techniques. Therefore, in 1990 it was decided to update the indexes. So far, the process has been completed for the Herbarium Arcangeli, composed of about 3800 entities partly collected by G. Arcangeli himself either in the Pisa Garden, that he directed from 1880 until 1915, or in natural areas, partly obtained by other botanists.

The species list was stored in a computer using a database management system that allows easy access to species name and item location.

A similar list is being generated for the specimens collected in Egypt by G.Raddi, that lie intermingled with the current collection.

Other collections have recently been revised, with interesting results : the Herbarium Bottini was found to contain species not yet reported for Italy (Cortini Pedrotti *et al.*, 1991), while the Herbarium Pellegrini yielded data on species of the Apuan Alps and the neighbouring districts (Garbari and Del Carratore, 1992).

A further research line undertakes the study of old herbaria, with pre- linnaean nomenclature; these studies are currently in progress, but their results appear very promising especially in the correlation between old and current plant names.

The Herbarium Horti Botanici Pisani is open to scholars wishing to study particular genera or groups of the italian flora. A loan service is available to institutions on exchange basis, by addressing a request to the Herbarium Curator, Dr. L.Amadei.

Computer based indexes, as soon as they are available for all the collections, will help offering a better service.

REFERENCES

Amadei L. Note sull' Herbarium Horti Pisani : l' origine delle collezioni. *Museol. Sci.*, 4(1-2) : 119-129. 1987.

Arber, A. Herbals. Their origin and evolution. A chapter in the history of botany, 1470-1670. Cambridge. 1986.

Bechi, N., P. Miceli and F. Garbari. Indagini biosistematiche sulla flora apuana. III contributo. *Atti Soc. Tosc. Sci. Nat. Mem*, Serie B. 98 : 171-237 (1991) 1992.

Bedini, G. and F. Garbari (eds.) : Proceedings of the Symposium "The 400 years of the Pisa Botanic Garden. The Botanic Garden : is its past the key to its future?" Museol. Sci., in press. 1992.

Chiarugi, A. Le date di fondazione dei primi Orti Botanici del mondo : Pisa (estate 1543); Padova (7 luglio 1545); Firenze (1 dicembre 1545). *Nuovo Giorn. Bot. It.*, 60 : 738-839. 1953.

Chiovenda, E. Un antichissimo erbario anonimo del Museo Botanico di Firenze. *Ann. Bot.* (*Roma*) 17 (4) : 119-139. 1927.

Cortini, Pedrotti C., R. Schumacker M. Aleffi and E. Ferrarini. Elenco critico delle briofite delle Alpi Apuane (Toscana, Italia). *Bull. Soc. Royal. Sci. Leige*. 60(4-5) : 149-361. 1991.

Cristofolini, G. Luca Ghini a Bologna : la nascita della nuova scienza. *Museol. Sci.* 8(3-4) : 207-236 (1991) 1992.

De Toni, G.B. Spigolature aldrovandiane. VI. Le piante dell antico Orto Botanico di Pisa ai tempi di Luca Ghini. *Ann. Bot.* 5(3) : 425-440. 1907.

——— I placiti di Luca Ghini (primo lettore dei Semplici in Bologna) intorno a piante descritte nei Commentarii di Dioscoride. *Memorie del R. Istituto Veneto di Lettere Scienze e Arti.* 27 (8) : 3 - 49. 1907a.

Galassi, N. Luca Ghini, una vita per la scienza. *Museol. Sci.* 8(3-4) : 187-205 (1991) 1992.

Garbari, F. Nasce presso lo Studio pisano, nel XVI secolo, la botanica moderna. In the catalogue of the exhibition "Livorno e Pisa: due citt e un territorio nella politica dei Medici", Pisa, pp. 527-533. 1980.

——— Proceedings of the Meeting "Conoscenza scientifica e stato della conservazione della natura in Toscana". Pisa. 1983 (ed).

———L' indagine citotassonomica in Italia : cronache, risultati e prospettive. In : Pedrotti F. (ed.), Cento anni di ricerche botaniche in Italia, Societã Botanica Italiana, Firenze, pp. 519-526. 1988.

——— Luca Ghini a Pisa, cardine della cultura botanica del XVI secolo. *Museol. Sci.* 8(3-4) : 223-236 (1991) 1992.

Tomasi L. Tongiorgi and A. tosi. Giardino dei Semplici. L' Orto Botanico di Pisa dal XVI al XX secolo. Pisa, 397 pp. 1991.

——— and F. Carratare. Del. Apuan flora and the herbarium of P. Pellegrini at Pisa. In : Botanical collections and scientific research, proceedings of the Symposium. Webbia, in press (1993) 1992.

Maugini, E. Scienza ed Arte : Giovan Battista Amici e i ceraioli. *Atti Soc. Tosc. Sci. Nat. & Mem. B*, 94, 1987: 1-24. 1987.

Moggi, G. Andrea Cesalpino botanico. *Atti e Memorie dell Accademia Petrarca di Lettere Arit e Scienze", n.s.*, 42: 235-249.1981.

Monti , G. and C. Del Prete . I modelli ceroplastici dell' Istituto ed Orto botanico pisano : i funghi di Luigi Calamai. *Atti Soc. Tosc. Sci. Nat., Mem. B*, 85 : 217-232. 1978.

Savi, G. Notizie per servire alla storia del Giardino e Museo della I. e. R. Universitã di Pisa. 1828.

——— Sopra alcune Acacie egiziane. Memoria del Prof. cavaliere Gaetano Savi. Pisa, 31 pp. 1830.

Seybold S. Luca Ghini, Leonhart Rauwolffu nd Leonhart Fuchs. Uber die Herkunft der Acquarelle im Wiener Krauterbuchmanuscript von Fuchs. *Jh. Ges. Naturkunde*, 145 : 239-264. 1990.

Tomei, P. E. Le raccolte botaniche di Giuseppe Raddi in Egitto. In the Proceedings of the Symposium "Ippolito Rosellini: passato e presente in una disciplina", Pisa, pp. 25-31. 1980.

——— G. Longombardo and A. Lippi. Specie vegetali igrofile delle zone dulciacquicole della Toscana planiziale : aspetti floristici e bioecologici. Pisa, 82 pp. 1991.